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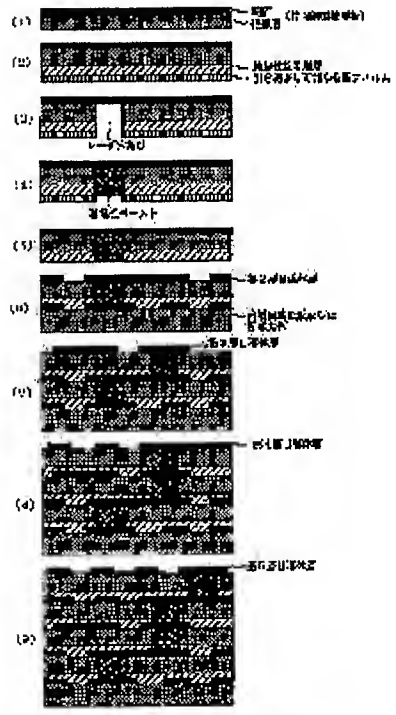
(54) MANUFACTURE OF MULTI-LAYER WIRING BOARD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method of manufacturing a multi-layer wiring board with higher density, which can conduct simultaneously a laminating of the multi-layered structure of the multi-layer wiring board and an interlayer electrical connection of the wiring board.

SOLUTION: In a method of manufacturing a multilayer wiring board, which is made an interlayer electrical connection with a conductive paste, a laser beam is irradiated on the surface side of an organic film formed of a material for multilayer board use, which consists of an insulative bonding agent layer provided on the surface of an insulating layer on a single-sided copper-clad laminate and a peelable organic film provided on the surface of the insulative bonding agent layer, and a non-through hole to reach a copper foil is opened in a place where the interlayer electrical connection is made. Then, the conductive paste is filled in the non-through hole and this conductive paste is put in a semi-cured state. The organic film is peeled off from the insulative bonding agent layer, the copper foil is aligned with the surface of a wiring board formed with an internal layer circuit in such a way that the copper foil is arranged outside of the internal layer circuit to superpose on the surface of the wiring board and the copper foil is pressed and heated to constitute integrally both of the copper foil and the wiring board. Then, a conductor pattern is formed on the copper foil provided on the outside by etching and in the case where the integrally constituted structure is further formed into a multi-layer structure, the above processes are repeated to manufacture the multi-layer wiring board.



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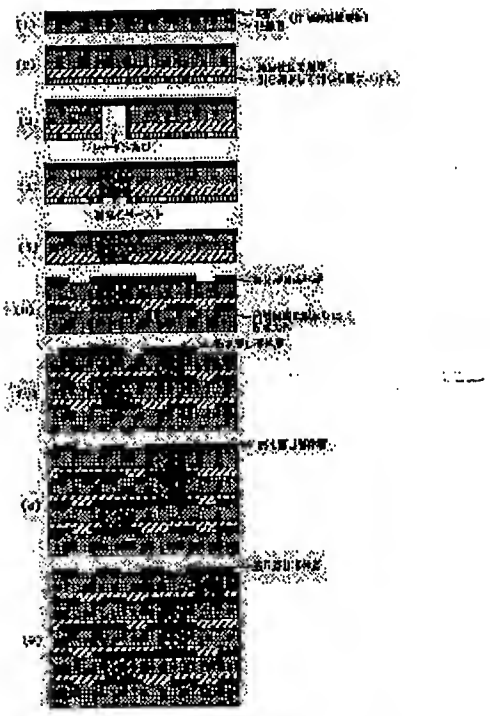
SOLUTION: In a method of manufacturing a multilayer wiring board, which is made an interlayer electrical connection with a conductive paste, a laser beam is irradiated on the surface side of an organic film formed of a material for multilayer board use, which consists of an insulative bonding agent layer provided on the surface of an insulating layer on a single-sided copper-clad laminate and a peelable organic film provided on the surface of the insulative bonding agent layer, and a non-through hole to reach a copper foil is opened in a place where the interlayer electrical connection is made. Then, the conductive paste is filled in the non-through hole and this conductive paste is put in a semi-cured state. The organic film is peeled off from the insulative bonding agent layer, the copper foil is aligned with the surface of a wiring board formed with an internal layer circuit in such a way that the copper foil is arranged outside of the internal layer circuit to superpose on the surface of the wiring board and the copper foil is pressed and heated to constitute integrally both of the copper foil and the wiring board. Then, a conductor pattern is formed on the copper foil provided on the outside by etching and in the case where the integrally constituted structure is further formed into a multi-layer structure, the above processes are repeated to manufacture the multi-layer wiring board.



CLAIMS

[Claim(s)]
[Claim 1]A manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of making a non-through hole which reaches copper foil in a place which irradiates with laser the field side of an organic film of a charge of multilayer board material which tore off on the surface of an insulating adhesive layer and its insulating adhesive layer, and provided a possible organic film in an insulating layer surface of one side copper clad laminate, and performs an electrical link between layers.
(b) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(c) A process of tearing off an organic film.
(d) A process which carries out alignment, is piled up, carries out application-of-pressure heating, and is unified so that copper foil of material obtained at a process of (c) on the surface of a wiring board in which an inner layer circuit was formed may become outside.
(e) A process of forming a conductive pattern in outside copper foil by etching.
(f) A process of repeating a process from (a) to (e) and manufacturing a multilayer interconnection board when multilayering furthermore.
[Claim 2]A manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of manufacturing an one side conductive pattern formation board in which a metallic copper conductive pattern was formed to one field of an insulating layer.
(b) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of an one side conductive pattern formation board.
(c) A process of making a non-through hole which arrives at a rear face of a metallic copper conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(d) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(e) A process of tearing off an organic film.
(f) A process which carries out alignment, is piled up, carries out application-of-pressure heating, and is unified so that a conductive pattern of an one side conductive pattern formation board which filled up the surface of a wiring board in which an inner layer circuit was formed with conductive paste obtained at a process of (e) may become outside.
(g) A process of repeating a process from (a) to (f) and manufacturing a multilayer interconnection board when multilayering furthermore.
[Claim 3]A manufacturing method of the multilayer interconnection board according to claim 1 or 2 which uses a wiring board by which an interlayer connection hole was filled up with conductive paste or insulating resin, and wiring was formed in both sides as a wiring board in which an inner

layer circuit was formed.
[Claim 4]A manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of manufacturing an inner layer circuit board in which a conductive pattern used as the 1st layer was formed.
(b) A process of manufacturing an one side conductive pattern formation board in which a conductive pattern of the 2nd layer was formed to one field of an insulating layer.
(c) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of an one side conductive pattern formation board.
(d) A process of making a non-through hole which arrives at a rear face of an one side conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of manufacturing an one side conductive pattern formation board which formed a conductive pattern of the n-th layer, respectively by repeating a process of (e) from (b) also about a conductor layer exceeding the 2nd layer.
(g) A process of tearing off an organic film from an one side conductive pattern formation board.
(h) A process of manufacturing a multilayer interconnection board by carrying out alignment of the one side conductive pattern formation board filled up with conductive paste obtained from (b) at a process of (g), piling it up, carrying out application-of-pressure heating, and uniting with the conductive pattern surface of an inner layer circuit board in which a conductive pattern used as the 1st layer was formed.
[Claim 5]A manufacturing method of the multilayer interconnection board according to claim 4 which an interlayer connection hole is filled up with conductive paste or insulating resin, and uses a double-sided board with which wiring was formed in both sides as an inner layer circuit board, carries out alignment of the one side conductive pattern formation board of the 2nd more than layer, piles it up, carries out application-of-pressure heating, and is united with the surface.

[Claim 6]A manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which consists of a n layer which performs an interlayer connection with conductive paste.
(a) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of one side copper clad laminate which provided copper foil used as a conductor layer of the n-th layer in one side of an insulating layer.
(b) A process of manufacturing an one side conductive pattern formation board which formed a metallic copper conductive pattern of eye a ** (n-1) layer from the 2nd layer.
(c) A process of tearing off from the 2nd layer on the surface of an insulating adhesive layer and its insulating adhesive layer to an insulating layer surface of an one side conductive pattern formation board of eye a ** (n-1) layer, and providing a possible organic film.
(d) A process of making copper foil of the n-th layer, and a non-through hole which arrives at a rear face of an one side conductive pattern formation board of eye a ** (n-1) layer from the 2nd layer in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up this non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of tearing off an organic film.
(g) A process of manufacturing a multilayer substrate by carrying out alignment of an one side conductive pattern formation board and one side copper clad laminate of the n-th layer which were filled up with conductive paste obtained at copper foil for forming a conductor of the 1st layer, and a process from (a) to (f), piling them up, carrying out application-of-pressure heating,

and unifying.
(h) A process of forming an outer layer circuit of the 1st layer and the n-th layer, and manufacturing a multilayer interconnection board by etching copper foil of the outermost layer.
[Claim 7]A manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of producing a wiring board in which an inner layer circuit which filled up an interlayer connection hole with conductive paste or insulating resin, and formed wiring in both sides as a wiring board in which an inner layer circuit was formed was formed.
(b) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of one side copper clad laminate which provided copper foil used as a conductor layer in one side of an insulating layer as a substrate for the outermost layers.
(c) A process of producing an one side conductive pattern formation board in which a metallic copper conductive pattern was formed, as a substrate for conductor layers except a substrate for the outermost layers, and a wiring board in which an inner layer circuit was formed, tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer to the insulating layer surface, and providing a possible organic film.
(d) A process of making a non-through hole which arrives at copper foil of a substrate for the outermost layers, and a rear face of a metallic copper conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up this non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of tearing off an organic film.
(g) A process of manufacturing a multilayer substrate by carrying out alignment of the substrate for the outermost layers, piling it up, carrying out application-of-pressure heating, and uniting with an one side conductive pattern formation board produced at a process of (b), (c), (d), (e), and (f), and its outside to both sides of a wiring board in which an inner layer circuit was formed.
(h) A process of etching copper foil of the outermost layer, forming an outer layer circuit, and manufacturing a multilayer interconnection board.
[Claim 8]A manufacturing method of the multilayer interconnection board according to any one of claims 1 to 7 which is the almost same height as an insulating adhesive layer side where a fill ration to a non-through hole of conductive paste tore off and a possible organic film is torn off.
[Claim 9]By tearing off with the formed element / solvent component ratio of conductive paste, and choosing thickness of a possible organic film, A manufacturing method of the multilayer interconnection board according to any one of claims 1 to 8 it was made to become the almost same height as an insulating adhesive layer side where a fill ration to a non-through hole of conductive paste when conductive paste is made into a semi hardened state tore off and a possible organic film is torn off.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the manufacturing method of the multilayer interconnection board which performs the electrical link between layers with conductive paste.
[0002]
[Description of the Prior Art]A through hole is made in the substrate which has an adhesive property as a manufacturing method of the multilayer interconnection board which performs an interlayer connection with conductive paste, The through hole is filled up with conductive paste, and the method of carrying out the application-of-pressure heating unification of the circuit conductor in piles, and carrying out flow-izing between layers and multilayering lamination to the both sides simultaneously is indicated by JP,6-21619,A.
[0003]
[Problem(s) to be Solved by the Invention]After the method of JP,6-21619,A makes the through hole for an interlayer connection in the substrate which has adhesive resin of a semi hardened state and fills up the through hole with conductive paste, it piles up with a circuit conductor, application-of-pressure heating is carried out, and it is unified. In this manufacturing method, there is a fear of the position of the through hole filled up with conductive paste for the interlayer connection shifting for the cure shrinkage of that a substrate is not restrained with a circuit conductor but resin of a semi hardened state flows by an application-of-pressure heating process, or use resin. It is fundamentally important that the position of a continuity hole and an inner layer circuit is in agreement in the multilayer interconnection board. In JP,6-21619,A, in order to avoid this position gap, the aromatic polyamide fiber cloths which cannot change easily due to an application-of-pressure heating process are used as a substrate. While aromatic polyamide textiles have the strong point of it being hard and being hard to change, they are expensive, and there is a problem that use of the conventional drill machine, a punching machine, a router machine, etc., etc. is remarkable, and difficulty or its working speed is low, by indispensable puncturing and shaping process for alignment by the manufacturing process of a multilayer board. An object of this invention is to provide the manufacturing method of the multilayer interconnection board in which processability is easy and the densification of wiring and sheet-metal-izing are possible.
[0004]
[Means for Solving the Problem]This invention relates to a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste, and provides five kinds of manufacturing methods from the following 1st to the 5th. The 1st manufacturing method is a manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of making a non-through hole which reaches copper foil in a place which irradiates with laser the field side of an organic film of a charge of multilayer board material which tore off on the surface of an insulating adhesive layer and its insulating adhesive layer, and provided a possible organic film in an insulating layer surface of one side copper clad laminate, and performs

an electrical link between layers.
(b) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(c) A process of tearing off an organic film.
(d) A process which carries out alignment, is piled up, carries out application-of-pressure heating, and is unified so that copper foil of material obtained at a process of (c) on the surface of a wiring board in which an inner layer circuit was formed may become outside.
(e) A process of forming a conductive pattern in outside copper foil by etching.
(f) A process of repeating a process from (a) to (e) and manufacturing a multilayer interconnection board when multilayering furthermore.
[0005]The 2nd manufacturing method is a manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of manufacturing an one side conductive pattern formation board in which a metallic copper conductive pattern was formed to one field of an insulating layer.
(b) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of an one side conductive pattern formation board.
(c) A process of making a non-through hole which arrives at a rear face of a metallic copper conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(d) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(e) A process of tearing off an organic film.
(f) A process which carries out alignment, is piled up, carries out application-of-pressure heating, and is unified so that a conductive pattern of an one side conductive pattern formation board which filled up the surface of a wiring board in which an inner layer circuit was formed with conductive paste obtained at a process of (e) may become outside.
(g) A process of repeating a process from (a) to (f) and manufacturing a multilayer interconnection board when multilayering furthermore.
[0006]The 3rd manufacturing method is a manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of manufacturing an inner layer circuit board in which a conductive pattern used as the 1st layer was formed.
(b) A process of manufacturing an one side conductive pattern formation board in which a conductive pattern of the 2nd layer was formed to one field of an insulating layer.
(c) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of an one side conductive pattern formation board.
(d) A process of making a non-through hole which arrives at a rear face of an one side conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up a non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of manufacturing an one side conductive pattern formation board which formed a conductive pattern of the n-th layer, respectively by repeating a process of (e) from (b) also about a conductor layer exceeding the 2nd layer.
(g) A process of tearing off an organic film from an one side conductive pattern formation board.
(h) A process of manufacturing a multilayer interconnection board by carrying out alignment of the one side conductive pattern formation board filled up with conductive paste obtained from (b) at a process of (g), piling it up, carrying out application-of-pressure heating, and uniting with the conductive pattern surface of an inner layer circuit board in which a conductive pattern used as the 1st layer was formed.

[0007]The 4th manufacturing method is a manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of one side copper clad laminate which provided copper foil used as a conductor layer of the n-th layer in one side of an insulating layer.
(b) A process of manufacturing an one side conductive pattern formation board which formed a metallic copper conductive pattern of eye a ** (n-1) layer from the 2nd layer.
(c) A process of tearing off from the 2nd layer on the surface of an insulating adhesive layer and its insulating adhesive layer to an insulating layer surface of an one side conductive pattern formation board of eye a ** (n-1) layer, and providing a possible organic film.
(d) A process of making copper foil of the n-th layer, and a non-through hole which arrives at a rear face of a metallic copper conductive pattern of eye a ** (n-1) layer from the 2nd layer in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up this non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of tearing off an organic film.
(g) A process of manufacturing a multilayer substrate by carrying out alignment of an one side conductive pattern formation board and one side copper clad laminate of the n-th layer which were filled up with conductive paste obtained at copper foil for forming a conductor of the 1st layer, and a process from (a) to (f), piling them up, carrying out application-of-pressure heating, and unifying.
(h) A process of forming an outer layer circuit of the 1st layer and the n-th layer, and manufacturing a multilayer interconnection board by etching copper foil of the outermost layer.
[0008]The 5th manufacturing method is a manufacturing method of a multilayer interconnection board including the following processes in a manufacturing method of a multilayer interconnection board which performs an interlayer connection with conductive paste.
(a) A process of producing a wiring board in which an inner layer circuit which filled up an interlayer connection hole with conductive paste or insulating resin, and formed wiring in both sides as a wiring board in which an inner layer circuit was formed was formed.
(b) A process of tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface of one side copper clad laminate which provided copper foil used as a conductor layer in one side of an insulating layer as a substrate for the outermost layers.
(c) A process of producing an one side conductive pattern formation board in which a metallic copper conductive pattern was formed, as a substrate for conductor layers except a substrate for the outermost layers, and a wiring board in which an inner layer circuit was formed, tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer to the insulating layer surface, and providing a possible organic film.
(d) A process of making a non-through hole which arrives at copper foil of a substrate for the outermost layers, and a rear face of a metallic copper conductive pattern in a place which tears off, irradiates the field side of a possible organic film with laser, and performs an electrical link between layers.
(e) A process of filling up this non-through hole with conductive paste, and making this conductive paste into a semi hardened state.
(f) A process of tearing off an organic film.
(g) A process of manufacturing a multilayer substrate by carrying out alignment of the substrate for the outermost layers, piling it up, carrying out application-of-pressure heating, and uniting with an one side conductive pattern formation board produced at a process of (b), (c), (d), (e), and (f), and its outside to both sides of a wiring board in which an inner layer circuit was formed.
(h) A process of etching copper foil of the outermost layer, forming an outer layer circuit, and manufacturing a multilayer interconnection board.

Here, a metallic copper conductive pattern of this invention meant what formed a copper conductive pattern in an insulating-layer board eventually with an additive process, formed a conductive pattern in one side of an insulating-layer board, and used as an one side conductive pattern formation board what was obtained by this. What formed a circuit pattern in copper foil of one side copper clad laminate was used as an one side conductive pattern formation board.
[0009]
[Embodiment of the Invention]As for the copper foil used by the one side copper clad laminate used by this invention, when the copper foil is a monolayer, it is preferred that it is 9 micrometers to 70 micrometers. When a line/space forms less than 50micrometers /very detailed wiring of 50 micrometers, the still thinner thing of the thickness of copper foil is desirable, and it is preferred to use the composite foil which consists of a reinforcing layer of 3-8-micrometer ultra-thin copper foil and its ultra-thin copper foil in such a case. After application-of-pressure heating lamination, this reinforcing layer is torn off, and exfoliates, or etching removes it. There is peelable copper foil (Koga Circuit Foil, trade name) which tears off and consists of copper foil of 70-micrometer thickness and 9-micrometer ultra-thin copper foil as an example of possible composite foil. By etching, the composite foil (Mitsui Mining & Smelting Industry) etc. which composite-ized 5-micrometer ultra-thin copper foil are in aluminium foil as what can remove a reinforcing layer, and aluminium foil is removed by etching. Resin, such as phenol, epoxy, and polyimide, can be used as insulating-layer resin of one side copper clad laminate. This insulating layer is irradiated with laser and the hole for an interlayer connection is made. If the inorganic fiber exceeding the diameter of an interlayer connection is contained in this insulating layer, since the time which laser beam machining takes becomes long, productivity will become remarkably low. Therefore, it is preferred that the inorganic fiber of the length more than the diameter of the hole made by laser is not included in this insulating layer.
[0010]As an insulating adhesive layer, the adhesives or the adhesive film marketed can be used as an object for patchboards. As for these, what contains an epoxy resin, polyimide resin, etc. as an ingredient is preferred, for example, there is AS-3000 (the Hitachi Chemical Co., Ltd. make, trade name) as an epoxy resin system adhesive film which used the with a molecular weights of 100,000 or more amount epoxy polymer of polymers as the main ingredients. There is GF-3500 (the Hitachi Chemical Co., Ltd. make, trade name) as an epoxy resin system adhesive film which added conversion rubber. As a polyimide resin system adhesive film, there is AS-2500 (the Hitachi Chemical Co., Ltd. make, trade name). There is AS-6000 (the Hitachi Chemical Co., Ltd. make, trade name) as an epoxy resin system adhesive film in which the diameter distributed in resin the fibrous material whose length is about 5 micrometers - 100 micrometers at 0.1 micrometer - 6 micrometers.
[0011]These insulating adhesive layers can apply adhesives and an adhesive film to an insulating layer surface, or can also provide them by pasting ******. After applying the varnish which tore off and dissolved thermosetting resin etc. in the solvent on the possible organic film, it is obtained by drying a part for a solvent. When it does in this way, it can perform more easily tearing off on the surface of an insulating adhesive layer and its insulating adhesive layer, and providing a possible organic film in an insulating layer surface, and it is preferred. The thickness of this insulating adhesive layer is related to the thickness of the conductor layer of an inner layer circuit, and it is required from the point of the restoration nature of an inner-layer-circuit-conductors layer to be more than inner-layer-circuit-conductors layer thickness at least. When inner-layer-circuit-conductors layer thickness is 12 micrometers, it is made the thing of the thickness of an about 25-micrometer insulating adhesive layer. It can be filled up with at least about 10 micrometers of inner-layer-circuit-conductors layers if inner-layer-circuit-conductors layer thickness is about 5 micrometers. Generally the range of the thickness of this insulating adhesive layer is 10-500 micrometers. In order to obtain the charge of multilayer board material which tore off on the surface of the insulating adhesive layer provided in the insulating layer surface of one side copper clad laminate, and its insulating adhesive layer, and provided the possible organic film, It is obtained by pasting together what tore off to the insulating layer surface of one side copper clad laminate, and applied the insulating adhesive layer to the possible organic film.

[0012]It tears off and a possible organic film needs to be easily processible by the laser used in order to make a non-through hole. This point to an organic film is preferred. In applying the thermosetting resin etc. which tear off and become a possible organic film with an insulating adhesive layer, in order to carry out stoving removal of the part for a solvent after spreading, the heat resistance in this cooking temperature is required. As such an organic film, polyethylene terephthalate, polypropylene, the Polly 4-methylpentene- 1, polyfluoroethylene, etc. can be used. The thickness of these organic films is not less than 5 micrometers, and its thin thing is desirable from a point of laser-beam-machining speed. From a point of handling nature, a certain amount of thickness is required. As for such a point to thickness, it is preferred that they are 10 micrometers - 70 micrometers. This organic film is torn off after carrying out printing restoration of the conductive paste at a non-through hole. The restoration to the non-through hole of conductive paste has preferred print processes. Conductive paste is applied also to the insulating part of the peripheral part of a non-through hole at the time of this printing. It is necessary to remove this inconvenient conductive paste. the conductive paste applied in this invention -- this organic film -- tearing off -- it removes.
[0013]Laser is used for puncturing of a non-through hole. As laser, although there are excimer laser, carbon dioxide gas laser, etc., points, such as working speed and a conversion cost, to carbon dioxide gas laser is preferred. As conductive paste with which a non-through hole is filled up, The conductive paste and the thermoplastic conductive paste which similarly mixed conductive particles, such as metal particles, a conductive organic matter, and carbon, which used together the thermosetting conductive paste or ultraviolet curing nature which mixed conductive particles, such as metal particles, a conductive organic matter, and carbon, and thermosetting can be used. A non-through hole is filled up with these conductive paste by printing etc. It tears off after printing and a possible organic film is removed. As a result, it is as thick as the quantity related to the thickness of the organic film, and conductive paste is printed. The almost same height as an insulating adhesive layer side of the fill ration of conductive paste is desirable. Conductive paste is contracted, when heating removes a part for the solvent in conductive paste and it is made a semi hardened state. This shrinkage amount is influenced by solvent concentration. Therefore, a desirable fill ration is obtained by optimizing the thickness of a film, and the combination for a solvent.
[0014]As an inner layer circuit board used as a wiring board in which the inner layer circuit used by this invention was formed, the one side copper clad laminate of an epoxy resin system, a phenol resin system, and a polyimide resin system containing a paper base and a glass base material can be used. The double-sided copper clad laminate which consists of these resin and substrates can be used. A conductive pattern is formed using both etching, or plating and etching using these substrates. What formed the conductive pattern with the additive process can be used for the epoxy resin system, phenol resin system, and polyimide resin system board containing a paper base and a glass base material. The thing in which the conductive pattern was formed on the surfaces, such as a metal substrate and a ceramic substrate, can also be used. In the case of the double-sided circuit board by which the inner layer board formed the circuit in the both sides, the interlayer connection hole can also use the double-sided circuit board filled up with conductive paste or insulating resin. Alignment is performed, application-of-pressure heating is carried out, and it is made to unify so that the wiring board which formed the layer circuit among these, and the insulating adhesive layer which filled up the non-through hole with conductive paste may touch. It is multilayered at the same time the conductive paste and the insulating adhesive layer of a semi hardened state carry out adhesion hardening and the electrical link between layers is performed at this process. Although it is dependent on the resin to be used, generally the ranges of cooking temperature are 160 ** - 280 **. Generally a pressure is the range of 5MPa - 50MPa. Then, wiring formation of the surface copper foil is carried out by etching. In multilayering on this surface, the conductive paste restoration insulating adhesive layer manufactured through the same process is piled up, and it multilayers, and multilayers one by one by carrying out wiring formation of the surface copper foil by etching.

[0015]As an insulating layer used for the one side conductive pattern formation board in which

the metallic copper conductive pattern was formed to one field of the insulating layer, thermosetting resin, such as a phenol resin system, an epoxy resin system, and a polyimide resin system, is used. This insulating layer irradiates with laser and makes the hole for an interlayer connection. If the inorganic fiber exceeding the diameter of an interlayer connection is contained in this insulating layer, since the time which laser beam machining takes becomes long, productivity will become remarkably low. Therefore, it is desirable not to include the inorganic fiber of the length more than the diameter of the hole made by laser in this insulating layer. A metallic copper conductive pattern is formed in this insulating-layer board with an additive process, and an one side conductive pattern formation board is manufactured. Or an one side conductive pattern formation board is manufactured by etching copper foil of above-mentioned one side copper clad laminate.

[0016]It tears off to the insulating layer surface of this one side conductive pattern formation board with an insulating adhesive layer by an above-mentioned method, and a possible organic film is provided in it. Next, a non-through hole is made by an above-mentioned method, and an organic film is torn off, after being filled up with conductive paste and making this conductive paste into a semi hardened state. By an above-mentioned method, alignment of the one side conductive pattern formation board with an insulating adhesive layer filled up with conductive paste is carried out, and application-of-pressure heating is carried out on condition of ****, and it unites with the surface of the wiring board in which the inner layer circuit was formed. Since the conductive pattern is already formed by this method, multilayering is performed simultaneously with application-of-pressure heating unification. This process is repeated successively and it multilayers. Alignment of the one side conductive pattern formation board with an insulating adhesive layer filled up with the conductive paste of the 2nd to [the wiring board which formed the inner layer circuit by the above-mentioned method, and] n-th layer produced by the above-mentioned method is carried out, Total layers can be unified with one application-of-pressure heating, and formation and a flow of the conductive pattern of total layers can be made to complete simultaneously by unifying on above-mentioned application-of-pressure heating conditions. Use copper foil instead of the wiring board in which the inner layer circuit was formed, and the conductive pattern formation board obtained from the 2nd layer by the above-mentioned method to eye a ** (n-1) layer is used, After unifying total layers with one application-of-pressure heating by using above-mentioned one side copper clad laminate for the n layer eye of the outermost layer, when only an outer layer forms a conductive pattern by etching, a multilayer interconnection board can also be obtained.

[0017]Since this method is performing the multilayering laminating process and the interlayer connection process simultaneously as described above, the manufacturing process of the multilayer interconnection board which was being manufactured through the conventional complicated process can simplify it substantially. Since a diameter can process the minute diameter of a 0.1-mm level in order to make a non-through hole with laser, manufacture of a high-density multilayer interconnection board is possible.

[0018]

[Example]

(Example 1) As shown in drawing 1 (1), 18-micrometer copper foil in thickness was made to paste together and harden epoxy resin system adhesive film AS-6000 (the Hitachi Chemical Co., Ltd. make, trade name) as an insulating layer, and the one side copper clad laminate whose whole thickness is 0.1 mm was prepared. Next, as shown in drawing 1 (2), Tear off and as a possible organic film. It pasted together so that the field of the insulating adhesive layer of an insulating adhesive layer coating film with a thickness of 30 micrometers which carried out coating of AS-6000 used as an insulating adhesive layer to the 30-micrometer-thick polyethylene terephthalate film, and was made into the semi hardened state might touch the field of the insulating layer of one side copper clad laminate, and the charge of multilayer board material was prepared. Next, as shown in drawing 1 (3), the non-through hole with a diameter of 0.15 mm which irradiates with carbon dioxide gas laser the place which performs the electrical link between layers, and reaches copper foil was made. Next, as shown in drawing 1 (4), copper paste NF-2000 (the Tatsuta Electric Wire & Cable Co., Ltd. make, trade name) was printed to the polyethylene terephthalate

film side, the non-through hole was filled up with copper paste, and it dried for 10 minutes at 150 **. Next, as shown in drawing 1 (5), the polyethylene terephthalate film was torn off. Next, as shown in drawing 1 (6), the thickness of copper foil forms a circuit pattern for the glass epoxy one side copper clad laminate whose whole thickness is 0.2 mm with an etching method at 18 micrometers, The charge of multilayer board material which filled up the non-through hole with copper paste was laid on top of the surface of the wiring board in which this inner layer circuit was formed, for 60 minutes, application-of-pressure heating was carried out, pressure 2.5MPa and the temperature of 170 ** produced the multilayer board, and wiring formation of the outside copper foil was carried out with the etching method. As shown in Drawing (7), (8), and (9), the same process was repeated and the multilayer interconnection board of the 3rd layer, the 4th layer, and the 5th layer was manufactured.

[0019](Example 2) As shown in drawing 2 (1), the 0.1-mm-thick glass epoxy double-sided board was prepared. Next, as shown in drawing 2 (2), a 0.2-mm through hole was made. Next, as shown in drawing 2 (3), 12-micrometer-thick copper plating was performed to the whole including the through hole, and the through hole was filled up with insulating resin after that. Next, the wiring board which formed the inner layer circuit by etching as shown in drawing 2 (4) was obtained. Next, as shown in drawing 2 (5) and (6), the charge of multilayer board material was produced by the same method as Example 1 showed. Next, as shown in drawing 2 (7), alignment of the charge of multilayer board material was carried out to the surface of the substrate in which the inner layer circuit was formed, it was put on it, for 60 minutes, application-of-pressure heating was carried out and pressure 2.5MPa and the temperature of 170 ** produced the multilayer board. Next, as shown in drawing 2 (8), the circuit was formed by etching. The multilayer interconnection board as shown in (9) of drawing 2 was manufactured by multilayering through the same process as drawing 2 (5), (6), and (7), and etching surface copper foil.

[0020](Example 3) As shown in drawing 3 (1), 18-micrometer copper foil in thickness was made to paste together and harden epoxy resin system adhesive film AS-6000 (the Hitachi Chemical Co., Ltd. make, trade name) as an insulating layer, and the one side copper clad laminate whose whole thickness is 0.1 mm was prepared. Next, as shown in drawing 3 (2), copper foil was etched and the conductive pattern of the 2nd layer was formed. Next, as shown in drawing 3 (3), tear off and as a possible organic film to a 50-micrometer-thick polyethylene terephthalate film. It pasted together so that the field of the insulating adhesive layer of an insulating adhesive layer coating film with a thickness of 30 micrometers which carried out coating of AS-6000 used as an insulating adhesive layer, and was made into the semi hardened state might touch the field of the insulating layer of one side copper clad laminate. Next, as shown in drawing 3 (4), the non-through hole with a diameter of 0.15 mm which irradiates with carbon dioxide gas laser the place which makes connection between layers, and reaches copper foil was made. Next, as shown in drawing 3 (5), copper paste NF-2000 (the Tatsuta Electric Wire & Cable Co., Ltd. make, trade name) was printed to the polyethylene terephthalate film side, the non-through hole was filled up with copper paste, and it dried for 10 minutes at 150 **. Next, as shown in drawing 3 (6), the polyethylene terephthalate film was torn off. Next, as shown in drawing 3 (7), Carry out alignment of the one side wiring formation board which filled up with copper paste the wiring board surface in which the circuit pattern was formed in for the glass epoxy one side copper clad laminate whose whole thickness is 0.2 mm with the etching method at 18 micrometers, and the thickness of copper foil produced the inner strake and formed the inner layer circuit, and Pressure 2.5MPa, For 60 minutes, application-of-pressure heating was carried out and the temperature of 170 ** produced the 2nd layer conductor layer. Next, as shown in drawing 3 (8), (9), and (10), by the same process as (1) to (6), the copper paste restoration one side wiring formation board of the 3rd layer, the 4th layer, and the 5th layer was produced, and the multilayer interconnection board was manufactured like the process of (7).

[0021](Example 4) As shown in drawing 4 (1), the 0.1-mm-thick glass epoxy double-sided board was prepared. Next, as shown in drawing 4 (2), a 0.2-mm through hole was made. Next, as shown in drawing 4 (3), 12-micrometer-thick copper plating including a through hole was performed, and the through hole was filled up with insulating resin. Next, the wiring board which formed the inner layer circuit by etching as shown in drawing 4 (4) was produced. Next, as shown in drawing 4 (5)

and (6), the one side conductive pattern formation board which filled up copper paste with the same method as Example 3 showed was produced. Next, as shown in drawing 4 (7), alignment of the one side conductive pattern formation board filled up with copper paste was carried out to the surface of the wiring board in which the inner layer circuit was formed, it was put on it, for 60 minutes, application-of-pressure heating was carried out and pressure 2.5MPa and the temperature of 170 ** produced the multilayer board. As shown in drawing 4 (8), the multilayer interconnection board was manufactured through the same process as drawing 4 (5), (6), and (7).

[0022](Example 5) As shown in drawing 5 (1), 18-micrometer copper foil in thickness was made to paste together and harden epoxy resin system adhesive film AS-6000 (the Hitachi Chemical Co., Ltd. make, trade name) as an insulating layer, and the one side copper clad laminate whose whole thickness is 0.1 mm was prepared. Next, as shown in drawing 5 (2), copper foil was etched and the conductive pattern of the 2nd layer was formed. Next, tear off, as shown in drawing 5 (3), and as a possible organic film to a 50-micrometer-thick polyethylene terephthalate film. It pasted together so that the field of the insulating adhesive layer of an insulating adhesive layer coating film with a thickness of 30 micrometers which carried out coating of AS-6000 used as an insulating adhesive layer, and was made into the semi hardened state might touch the field of the insulating layer of one side copper clad laminate. Next, as shown in drawing 5 (4), the non-through hole with a diameter of 0.15 mm which irradiates with carbon dioxide gas laser the place which performs the electrical link between layers, and reaches copper foil was made. Next, as shown in drawing 5 (5), copper paste NF-2000 (the Tatsuta Electric Wire & Cable Co., Ltd. make, trade name) was printed to the polyethylene terephthalate film side, the non-through hole was filled up with copper paste, and it dried for 10 minutes at 150 **. Next, as shown in drawing 5 (6), the polyethylene terephthalate film was torn off, and the one side conductive pattern formation board filled up with copper paste was produced. The one side conductive pattern formation board which will be the 3rd layer, the 4th layer, and the 5th layer as similarly shown in drawing 5 (9), (8), and (7) was produced. Next, as shown in drawing 5 (10), the wiring board in which the thickness of copper foil formed the circuit pattern in for the glass epoxy one side copper clad laminate whose whole thickness is 0.2 mm with the etching method at 18 micrometers, and formed the inner layer circuit was produced. Next, as shown in drawing 5 (11), alignment of the one side conductive pattern formation board which filled up with the copper paste of the 2nd to 5th layer the wiring board surface in which the inner layer circuit was formed was carried out to turn in piles, for 60 minutes, application-of-pressure heating was carried out and pressure 2.5MPa and the temperature of 170 ** manufactured the multilayer interconnection board.

[0023](Example 6) As shown in drawing 6 (1), 18-micrometer copper foil in thickness was made to paste together and harden epoxy resin system adhesive film AS-6000 (the Hitachi Chemical Co., Ltd. make, trade name) as an insulating layer, and the one side copper clad laminate whose whole thickness is 0.1 mm was prepared. Next, as shown in drawing 6 (2), copper foil was etched and the conductive pattern of the 2nd layer was formed. Next, tear off, as shown in drawing 6 (3), and as a possible organic film to a 50-micrometer-thick polyethylene terephthalate film. It pasted together so that the field of the insulating adhesive layer of an insulating adhesive layer coating film with a thickness of 30 micrometers which carried out coating of AS-6000 as an insulating adhesive layer, and was made into the semi hardened state might touch the field of the insulating layer of one side copper clad laminate. Next, as shown in drawing 6 (4), the non-through hole with a diameter of 0.15 mm which irradiates with carbon dioxide gas laser the place which performs the electrical link between layers, and reaches copper foil was made. Next, as shown in drawing 6 (5), copper paste NF-2000 (the Tatsuta Electric Wire & Cable Co., Ltd. make, trade name) was printed to the polyethylene terephthalate film side, the non-through hole was filled up with copper paste, and it dried for 10 minutes at 150 **. Next, as shown in drawing 6 (6), the polyethylene terephthalate film was torn off, and the one side conductive pattern formation board filled up with the copper paste of the 2nd layer was produced. Similarly, as shown in drawing 6 (8), the one side conductive pattern formation board filled up with the copper paste of the 3rd layer was produced. As shown in drawing 6 (7), the charge of multilayer board material filled up with the copper paste of the 4th layer was produced by the same process as (5) from

drawing 1 (1) of Example 1. Next, as 18-micrometer copper foil in thickness is prepared as shown in drawing 6 (9), and shown in drawing 6 (10), Alignment of the charge of multilayer board material filled up with copper foil of the 1st layer, the one side conductive pattern formation board filled up with the copper paste of the 2nd layer and the 3rd layer, and the copper paste of the 4th layer was carried out to turn in piles, and pressure 2.5MPa and the temperature of 170 ** produced the multilayer board which carried out application-of-pressure heating and was unified for 60 minutes. Next, as shown in drawing 6 (11), with the etching method, wiring of the outermost layer was formed and the multilayer interconnection board was manufactured.

[0024]

[Effect of the Invention]As explained above, manufacture of the multilayer interconnection board in which the densification of wiring is possible is attained at a simple process by this invention.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1](1) – (9) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.
[Drawing 2](1) – (9) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.
[Drawing 3](1) – (10) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.
[Drawing 4](1) – (8) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.
[Drawing 5](1) – (11) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.
[Drawing 6](1) – (11) is a sectional view of the substrate in which one example of the manufacturing method of the multilayer interconnection board of this invention is shown.

[Translation done.]

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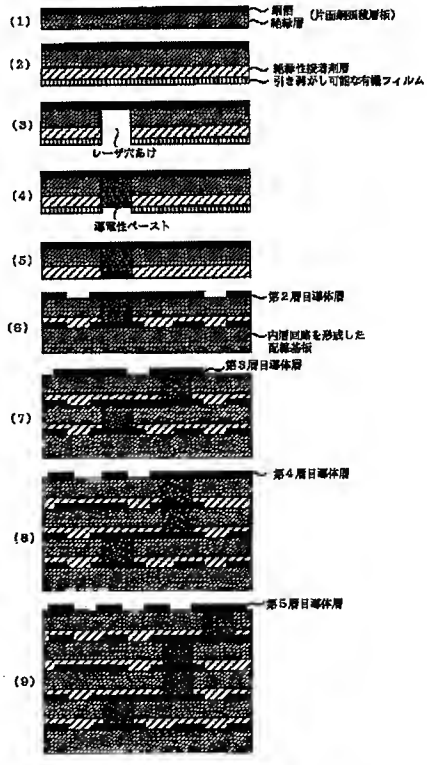
(54)【発明の名称】　多層配線板の製造方法

(57)【要約】
【課題】多層配線板の多層化積層と層間の電気的接続が同時に行なえる高密度化が可能な多層配線板の製造方法を提供する。
【解決手段】導電性ペーストで層間接続を行う多層配線板の製造方法において、（ａ）片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設けた多層板用材料の有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、銅箔に到達する非貫通穴をあける工程。（ｂ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。（ｃ）有機フイルムを引き剥がす工程。（ｄ）内層回路を形成した配線基板の表面に（ｃ）の工程で得た材料の銅箔が外側になるように位置合わせして重ね、加圧加熱して一体化する工程。（ｅ）エッチングにより外側の銅箔に導体パターンを形成する工程。（ｆ）更に多層化する場合に（ａ）から（ｅ）までの工程を繰り返して多層配線板を製造する工程を含むことを特徴とする多層配線板の製造方法。



【特許請求の範囲】
【請求項１】導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法。
（ａ）片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設けた多層板用材料の有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、銅箔に到達する非貫通穴をあける工程。
（ｂ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｃ）有機フイルムを引き剥がす工程。
（ｄ）内層回路を形成した配線基板の表面に（ｃ）の工程で得た材料の銅箔が外側になるように位置合わせして重ね、加圧加熱して一体化する工程。
（ｅ）エッチングにより外側の銅箔に導体パターンを形成する工程。
（ｆ）更に多層化する場合に（ａ）から（ｅ）までの工程を繰り返して多層配線板を製造する工程。
【請求項２】導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法。
（ａ）絶縁層の一方の面に金属銅導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｂ）片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｃ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、金属銅導体パターンの裏面に到達する非貫通穴をあける工程。
（ｄ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｅ）有機フイルムを引き剥がす工程。
（ｆ）内層回路を形成した配線基板の表面に（ｅ）の工程で得た導電性ペーストを充填した片面導体パターン形成基板の導体パターンが外側になるように位置合わせして重ね、加圧加熱して一体化する工程。
（ｇ）更に多層化する場合に（ａ）から（ｆ）までの工程を繰り返して多層配線板を製造する工程。
【請求項３】内層回路を形成した配線基板として層間接続穴が導電性ペーストまたは絶縁性樹脂で充填され、両面に配線が形成された配線基板を使用する請求項１または請求項２に記載の多層配線板の製造方法。
【請求項４】導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法。
（ａ）第１層目となる導体パターンを形成した内層回路板を製造する工程。
（ｂ）絶縁層の一方の面に第２層目の導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｃ）片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、片面導体パターンの裏面に到達する非貫通穴をあける工程。
（ｅ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｆ）第２層目を越える導体層についても（ｂ）から（ｅ）の工程を繰り返すことにより、第ｎ層目の導体パターンをそれぞれ形成した片面導体パターン形成基板を製造する工程。
（ｇ）片面導体パターン形成基板から有機フイルムを引き剥がす工程。
（ｈ）第１層目となる導体パターンを形成した内層回路板の導体パターン表面に（ｂ）から（ｇ）の工程で得た導電性ペーストを充填した片面導体パターン形成基板を位置合わせして重ね、加圧加熱して一体化することにより多層配線板を製造する工程。
【請求項５】内層回路板として層間接続穴が導電性ペーストまたは絶縁性樹脂で充填され、両面に配線が形成された両面板を使用し、その表面に第２層目以上の片面導体パターン形成基板を位置合わせして重ね、加圧加熱して一体化する請求項４に記載の多層配線板の製造方法。
【請求項６】導電性ペーストで層間接続を行うｎ層からなる多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法。
（ａ）第ｎ層目の導体層となる銅箔を絶縁層の片面に設けた片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｂ）第２層目から第（ｎ－１）層目の金属銅導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｃ）第２層目から第（ｎ－１）層目の片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、第ｎ層目の銅箔と第２層目から第（ｎ－１）層目の片面導体パターン形成基板の裏面に到達する非貫通穴をあける工程。
（ｅ）この非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｆ）有機フイルムを引き剥がす工程。
（ｇ）第１層目の導体を形成するための銅箔と（ａ）から（ｆ）までの工程で得た導電性ペーストを充填した片面導体パターン形成基板および第ｎ層目の片面銅張積層板を位置合わせして重ね、加圧加熱して一体化することによって多層基板を製造する工程。

（ｈ）最外層の銅箔をエッチングすることにより第１層目および第ｎ層目の外層回路を形成し多層配線板を製造する工程。

【請求項７】導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法。

（ａ）内層回路を形成した配線基板として、層間接続穴を導電性ペーストまたは絶縁性樹脂で充填し、両面に配線を形成した内層回路を形成した配線基板を作製する工程。

（ｂ）最外層用基板として、導体層となる銅箔を絶縁層の片面に設けた片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。

（ｃ）最外層用基板と内層回路を形成した配線基板を除く導体層用基板として、金属銅導体パターンを形成した片面導体パターン形成基板を作製し、その絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。

（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、最外層用基板の銅箔と金属銅導体パターンの裏面に到達する非貫通穴をあける工程。

（ｅ）この非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。

（ｆ）有機フイルムを引き剥がす工程。

（ｇ）内層回路を形成した配線基板の両面に、（ｂ）（ｃ）（ｄ）（ｅ）（ｆ）の工程で作製した片面導体パターン形成基板とその外側に最外層用基板を位置合わせして重ね、加圧加熱して一体化することにより多層基板を製造する工程。

（ｈ）最外層の銅箔をエッチングして外層回路を形成し多層配線板を製造する工程。

【請求項８】導電性ペーストの非貫通穴への充填量が引き剥がし可能な有機フイルムを引き剥がした状態で絶縁性接着剤層面とほぼ同じ高さである請求項１ないし請求項７のいずれかに記載の多層配線板の製造方法。

【請求項９】導電性ペーストの固形成分／溶剤成分比率と引き剥がし可能な有機フイルムの厚さを選ぶことにより、導電性ペーストを半硬化状態にした時の導電性ペーストの非貫通穴への充填量が引き剥がし可能な有機フイルムを引き剥がした状態で絶縁性接着剤層面とほぼ同じ高さになるようにした請求項１ないし請求項８のいずれかに記載の多層配線板の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、層間の電気的接続を導電性ペーストで行う多層配線板の製造方法に関する。

【０００２】

【従来の技術】導電性ペーストで層間接続を行う多層配線板の製造方法として接着性を有する基材に貫通穴をあけ、その貫通穴に導電性ペーストを充填し、その両面に回路導体を重ねて加圧加熱一体化して層間の導通化と多層化積層を同時に行う方法が特開平６-２１６１９号公報に開示されている。

【０００３】

【発明が解決しようとする課題】特開平６-２１６１９号公報の方法は半硬化状態の接着性樹脂を有する基材に層間接続のための貫通穴をあけ、その貫通穴に導電性ペーストを充填した後、回路導体と重ね合わせて加圧加熱して一体化するものである。この製造方法では基材が回路導体で拘束されておらず半硬化状態の樹脂が加圧加熱工程で流動することや使用樹脂の硬化収縮のため、層間接続のため導電性ペーストを充填した貫通穴の位置がずれる心配がある。多層配線板では導通穴と内層回路の位置が一致していることが基本的に重要である。特開平６-２１６１９号公報ではこの位置ずれを避けるために加圧加熱工程で変形しにくい芳香族ポリアミド繊維布を基材として使用している。芳香族ポリアミド繊維は堅くて変形しにくいという長所がある反面、高価であり、多層板の製造工程で不可欠の位置合わせ用の穴あけや外形加工で従来のドリルマシンやパンチングマシン、ルータマシン等の使用が困難または加工速度が著しく低いという問題がある。本発明は、加工性が容易であり配線の高密度化と薄板化が可能な多層配線板の製造方法を提供することを目的とする。

【０００４】

【課題を解決するための手段】本発明は、導電性ペーストで層間接続を行う多層配線板の製造方法に関するものであり、以下の第１から第５までの５種類の製造方法を提供するものである。第１の製造法は、導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法である。

（ａ）片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設けた多層板用材料の有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、銅箔に到達する非貫通穴をあける工程。

（ｂ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。

（ｃ）有機フイルムを引き剥がす工程。

（ｄ）内層回路を形成した配線基板の表面に（ｃ）の工程で得た材料の銅箔が外側になるように位置合わせして重ね、加圧加熱して一体化する工程。

（ｅ）エッチングにより外側の銅箔に導体パターンを形成する工程。

（ｆ）更に多層化する場合に（ａ）から（ｅ）までの工程を繰り返して多層配線板を製造する工程。

【０００５】第２の製造法は、導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法である。
（ａ）絶縁層の一方の面に金属銅導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｂ）片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｃ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、金属銅導体パターンの裏面に到達する非貫通穴をあける工程。
（ｄ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｅ）有機フイルムを引き剥がす工程。
（ｆ）内層回路を形成した配線基板の表面に（ｅ）の工程で得た導電性ペーストを充填した片面導体パターン形成基板の導体パターンが外側になるように位置合わせして重ね、加圧加熱して一体化する工程。
（ｇ）更に多層化する場合に（ａ）から（ｆ）までの工程を繰り返して多層配線板を製造する工程。
【０００６】第３の製造法は、導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法である。
（ａ）第１層目となる導体パターンを形成した内層回路板を製造する工程。
（ｂ）絶縁層の一方の面に第２層目の導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｃ）片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、片面導体パターンの裏面に到達する非貫通穴をあける工程。
（ｅ）非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｆ）第２層目を越える導体層についても（ｂ）から（ｅ）の工程を繰り返すことにより、第ｎ層目の導体パターンをそれぞれ形成した片面導体パターン形成基板を製造する工程。
（ｇ）片面導体パターン形成基板から有機フイルムを引き剥がす工程。
（ｈ）第１層目となる導体パターンを形成した内層回路板の導体パターン表面に（ｂ）から（ｇ）の工程で得た導電性ペーストを充填した片面導体パターン形成基板を位置合わせして重ね、加圧加熱して一体化することにより多層配線板を製造する工程。
【０００７】第４の製造法は、導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法である。
（ａ）第ｎ層目の導体層となる銅箔を絶縁層の片面に設けた片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｂ）第２層目から第（ｎ－１）層目の金属銅導体パターンを形成した片面導体パターン形成基板を製造する工程。
（ｃ）第２層目から第（ｎ－１）層目の片面導体パターン形成基板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、第ｎ層目の銅箔と第２層目から第（ｎ－１）層目の金属銅導体パターンの裏面に到達する非貫通穴をあける工程。
（ｅ）この非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｆ）有機フイルムを引き剥がす工程。
（ｇ）第１層目の導体を形成するための銅箔と（ａ）から（ｆ）までの工程で得た導電性ペーストを充填した片面導体パターン形成基板および第ｎ層目の片面銅張積層板を位置合わせして重ね、加圧加熱して一体化することによって多層基板を製造する工程。
（ｈ）最外層の銅箔をエッチングすることにより第１層目および第ｎ層目の外層回路を形成し多層配線板を製造する工程。
【０００８】第５の製造法は、導電性ペーストで層間接続を行う多層配線板の製造方法において、以下の工程を含むことを特徴とする多層配線板の製造方法である。
（ａ）内層回路を形成した配線基板として、層間接続穴を導電性ペーストまたは絶縁性樹脂で充填し、両面に配線を形成した内層回路を形成した配線基板を作製する工程。
（ｂ）最外層用基板として、導体層となる銅箔を絶縁層の片面に設けた片面銅張積層板の絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｃ）最外層用基板と内層回路を形成した配線基板を除く導体層用基板として、金属銅導体パターンを形成した片面導体パターン形成基板を作製し、その絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設ける工程。
（ｄ）引き剥がし可能な有機フイルムの面側にレーザを照射して、層間の電気的接続を行う場所に、最外層用基板の銅箔と金属銅導体パターンの裏面に到達する非貫通穴をあける工程。
（ｅ）この非貫通穴に導電性ペーストを充填して、この導電性ペーストを半硬化状態にする工程。
（ｆ）有機フイルムを引き剥がす工程。
（ｇ）内層回路を形成した配線基板の両面に、（ｂ）（ｃ）（ｄ）（ｅ）（ｆ）の工程で作製した片面導体パ

ターン形成基板とその外側に最外層用基板を位置合わせして重ね、加圧加熱して一体化することにより多層基板を製造する工程。
（ｈ）最外層の銅箔をエッチングして外層回路を形成し多層配線板を製造する工程。
ここで、本発明の金属銅導体パターンは、絶縁層基板にアディティブ法で最終的に銅の導体パターンを形成したものを意味し、絶縁層基板の片面に導体パターンを形成し、これによって得られたものを片面導体パターン形成基板とした。また、片面銅張積層板の銅箔に回路パターンを形成したものも片面導体パターン形成基板とした。
【０００９】
【発明の実施の形態】本発明で使用する片面銅張積層板で使用する銅箔は、その銅箔が単層の場合には、９μｍから７０μｍであることが好ましい。またライン／スペースが５０μｍ／５０μｍ未満の極めて微細な配線を形成する場合には、銅箔の厚さは更に薄いものが望ましく、このような場合には３～８μｍの極薄銅箔とその極薄銅箔の強化層からなる複合箔を使用することが好ましい。この強化層は加圧加熱積層後に、引き剥がして剥離するか、もしくはエッチングにより除去する。引き剥がし可能な複合箔の例として、７０μｍ厚さの銅箔と９μｍの極薄銅箔からなるピーラブル銅箔（古河サーキットホイル（株）、商品名）がある。エッチングによって強化層が除去できるものとしてアルミニウム箔に５μｍの極薄銅箔を複合化した複合箔（三井金属工業（株））等があり、アルミニウム箔をエッチングで除去する。片面銅張積層板の絶縁層樹脂としては、フェノール、エポキシ、ポリイミド類等の樹脂が使用できる。この絶縁層にはレーザを照射して層間接続のための穴をあける。層間接続の直径を越える無機質繊維がこの絶縁層に含まれていると、レーザ加工に要する時間が長くなるため生産性が著しく低くなる。そのため、この絶縁層にはレーザであける穴の直径以上の長さの無機繊維を含まないことが好ましい。
【００１０】絶縁性接着剤層としては配線板用として市販されている接着剤あるいは接着フィルムが使用できる。これらは、エポキシ樹脂やポリイミド樹脂等を成分として含むものが好ましく、例えば、分子量１０万以上の高分子量エポキシ重合体を主成分としたエポキシ樹脂系接着フイルムとしてＡＳ-３０００（日立化成工業（株）製、商品名）がある。また、変成ゴムを添加したエポキシ樹脂系接着フィルムとしてＧＦ-３５００（日立化成工業（株）製、商品名）がある。ポリイミド樹脂系接着フィルムとしてはＡＳ-２５００（日立化成工業（株）製、商品名）がある。直径が０．１μｍ～６μｍで長さが約５μｍ～１００μｍの繊維状物質を樹脂中に分散させたエポキシ樹脂系接着フイルムとしてＡＳ-６０００（日立化成工業（株）製、商品名）がある。
【００１１】これらの絶縁性接着剤層は、接着剤や接着フィルムを絶縁層表面に塗布したり貼付することによって設けることもできる。また、引き剥がし可能な有機フイルム上に例えば、熱硬化性樹脂等を溶剤に溶解したワニスを塗布した後、溶剤分を乾燥することによって得られる。このようにすると絶縁層表面に絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設けることがより容易にできて好ましい。この絶縁性接着剤層の厚さは内層回路の導体層の厚さと関係しており、内層回路導体層の充填性の点から、少なくとも内層回路導体層の厚さ以上であることが必要である。内層回路導体層の厚さが１２μｍの場合には２５μｍ程度の絶縁性接着剤層の厚さのものにする。内層回路導体層の厚さが５μｍ程度であれば、１０μｍ程度でも内層回路導体層を充填することができる。一般にはこの絶縁性接着剤層の厚さは１０～５００μｍの範囲である。片面銅張積層板の絶縁層表面に設けた絶縁性接着剤層とその絶縁性接着剤層の表面に引き剥がし可能な有機フイルムを設けた多層板用材料を得るには、片面銅張積層板の絶縁層表面に引き剥がし可能な有機フイルムに絶縁性接着剤層を塗布したものを貼り合わせることによって得られる。
【００１２】引き剥がし可能な有機フイルムは、非貫通穴をあけるために用いるレーザで容易に加工できることが必要である。この点から有機フイルムが好適である。引き剥がし可能な有機フイルムに絶縁性接着剤層となる熱硬化性樹脂等を塗布する場合には、塗布後に溶剤分を加熱乾燥除去するために、この加熱温度での耐熱性が必要である。このような有機フイルムとしては、ポリエチレンテレフタレート、ポリプロピレン、ポリ－４－メチルペンテン－１、ポリフッ化エチレン等が使用できる。これらの有機フイルムの厚さは５μｍ以上であり、レーザ加工速度の点からは薄いことが望ましい。取り扱い性の点からはある程度の厚さが必要である。このような点から厚さは、１０μｍ～７０μｍであることが好ましい。　この有機フイルムは、非貫通穴に導電性ペーストを印刷充填した後に引き剥がされる。導電性ペーストの非貫通穴への充填は印刷法が好ましい。この印刷時に非貫通穴の周辺部分の絶縁部分にも導電性ペーストが塗布される。この不都合な導電性ペーストは、除去する必要がある。本発明では塗布された導電性ペーストをこの有機フイルムの引き剥がしによって除去する。
【００１３】非貫通穴の穴あけには、レーザを使用する。レーザとしては、エキシマレーザ、炭酸ガスレーザ等があるが、加工速度や加工費等の点から炭酸ガスレーザが好ましいものである。非貫通穴に充填する導電性ペーストとしては、金属粒子、導電性有機物、カーボン等の導電性粒子を混入した熱硬化性の導電性ペーストあるいは紫外線硬化性と熱硬化性を併用した導電性ペースト、同じく金属粒子、導電性有機物、カーボン等の導電性粒子を混入した熱可塑性の導電性ペーストが使用でき

る。これらの導電性ペーストは印刷等によって非貫通穴に充填される。印刷後に引き剥がし可能な有機フイルムを除去する。その結果、有機フイルムの厚さに関係した量ほど厚く導電性ペーストが印刷される。導電性ペーストの充填量は絶縁性接着剤層面とほぼ同じ高さが望ましい。加熱によって導電性ペースト中の溶剤分を除去すると共に半硬化状態にした場合、導電性ペーストは収縮する。この収縮量は溶剤濃度に左右される。したがって、望ましい充填量は、フイルムの厚さと溶剤分の組み合わせを最適化することにより得られる。

【００１４】本発明で使用する内層回路を形成した配線基板として用いる内層回路基板としては、紙基材やガラス基材を含むエポキシ樹脂系、フェノール樹脂系、ポリイミド樹脂系の片面銅張積層板を使用することができる。また、これらの樹脂と基材からなる両面銅張積層板を使用することができる。これらの基板を使用してエッチングやめっきとエッチングの両方を用いて導体パターンを形成する。また、紙基材やガラス基材を含むエポキシ樹脂系、フェノール樹脂系、ポリイミド樹脂系基板にアディティブ法で導体パターンを形成したものも使用できる。また、金属基板やセラミック基板等の表面に導体パターンを形成したものも使用できる。内層基板がその両面に回路を形成した両面回路基板の場合には、層間接続穴は導電性ペーストまたは絶縁性樹脂で充填した両面回路基板を使用することもできる。これらの内層回路を形成した配線基板と非貫通穴に導電性ペーストを充填した絶縁性接着剤層とが接するように、位置合わせを行い、加圧加熱して一体化させる。この工程で、半硬化状態の導電性ペーストと絶縁性接着剤層が接着硬化して層間の電気的接続が行われると同時に多層化される。加熱温度は使用する樹脂に依存するが、一般には１６０℃～２８０℃の範囲である。圧力は一般に５ＭＰａ～５０ＭＰａの範囲である。この後、表面の銅箔をエッチングによって配線形成する。更にこの表面に多層化する場合には、同様の工程を経て製造した導電性ペースト充填絶縁性接着剤層を重ね合わせて多層化し、表面の銅箔をエッチングによって配線形成することによって順次、多層化する。

【００１５】絶縁層の一方の面に金属銅導体パターンを形成した片面導体パターン形成基板に使用する絶縁層としては、フェノール樹脂系、エポキシ樹脂系、ポリイミド樹脂系等の熱硬化性樹脂を使用する。この絶縁層はレーザを照射して層間接続のための穴をあける。層間接続の直径を越える無機質繊維がこの絶縁層に含まれていると、レーザ加工に要する時間が長くなるために生産性が著しく低くなる。そのため、この絶縁層にはレーザであける穴の直径以上の長さの無機繊維を含まないことが望ましい。この絶縁層基板にアディティブ法で金属銅導体パターンを形成して片面導体パターン形成基板を製造する。または上述の片面銅張積層板の銅箔をエッチングすることによって片面導体パターン形成基板を製造する。

【００１６】この片面導体パターン形成基板の絶縁層表面に上述の方法で絶縁性接着剤層と引き剥がし可能な有機フイルムを設ける。次に上述の方法で非貫通穴をあけ、導電性ペーストを充填してこの導電性ペーストを半硬化状態にした後、有機フイルムを引き剥がす。上述の方法で内層回路を形成した配線基板の表面に、導電性ペーストを充填した絶縁性接着剤層付きの片面導体パターン形成基板を位置合わせし、上述の条件で加圧加熱して一体化する。この方法では既に導体パターンが形成されているので、加圧加熱一体化と同時に多層化が行われる。この工程を順次繰り返して多層化する。また、上述の方法で内層回路を形成した配線基板と上述の方法で作製した第２層目から第ｎ層目の導電性ペーストを充填した絶縁性接着剤層付きの片面導体パターン形成基板を位置合わせし、上述の加圧加熱条件で一体化することによって、全層を一回の加圧加熱で一体化し、同時に全層の導体パターンの形成と導通を完了させることができる。また、内層回路を形成した配線基板の代わりに銅箔を使用し、第２層目から第（ｎ－１）層目までは上記の方法で得られた導体パターン形成基板を使用し、最外層のｎ層目に上述の片面銅張積層板を使用することによって全層を一回の加圧加熱で一体化した後、外層のみエッチングで導体パターンを形成することによって、多層配線板を得ることもできる。

【００１７】本方法は、上記したように、多層化積層工程と層間接続工程を同時に行なっているので、従来の複雑な工程を経て製造していた多層配線板の製造工程が大幅に簡略化できる。また、レーザによって非貫通穴をあけるために直径が０．１ｍｍレベルの微小径が加工できるので高密度の多層配線板の製造が可能である。

【００１８】

【実施例】

（実施例１）図１（１）に示すように、厚さ１８μｍ銅箔に、絶縁層としてエポキシ樹脂系接着フィルムＡＳ－６０００（日立化成工業（株）製、商品名）を貼り合わせて硬化させ全体の厚さが０．１ｍｍの片面銅張積層板を準備した。次に図１（２）に示すように、引き剥がし可能な有機フィルムとして厚さ３０μｍのポリエチレンテレフタレートフイルムに絶縁性接着剤層となるＡＳ－６０００を塗工し半硬化状態にした厚さ３０μｍの絶縁性接着剤層塗布フイルムの絶縁性接着剤層の面が片面銅張積層板の絶縁層の面と接するように貼り合わせ多層板用材料を準備した。次に図１（３）に示すように、層間の電気的接続を行なう場所に炭酸ガスレーザを照射して銅箔に到達する直径０．１５ｍｍの非貫通穴をあけた。次に図１（４）に示すように、銅ペーストＮＦ－２０００（タツタ電線（株）製、商品名）をポリエチレンテレフタレートフイルム面に印刷して非貫通穴に銅ペーストを充填し、１５０℃で１０分間乾燥した。次に図１

（５）に示すようにポリエチレンテレフタレートフイルムを引き剥がした。次に図１（６）に示すように、銅箔の厚さが１８μｍで全体の厚さが０．２ｍｍのガラスエポキシ片面銅張積層板をエッチング法で配線パターンを形成し、この内層回路を形成した配線基板の表面に、非貫通穴に銅ペーストを充填した多層板用材料を重ね合わせて、圧力２．５ＭＰａ、温度１７０℃、６０分間、加圧加熱して多層板を作製し、外側の銅箔をエッチング法で配線形成した。更に図（７）（８）（９）に示すように、同様の工程を繰り返して第３層、第４層、第５層の多層配線板を製造した。

【００１９】（実施例２）図２（１）に示すように、厚さが０．１ｍｍのガラスエポキシ両面板を用意した。次に図２（２）に示すように０．２ｍｍの貫通穴をあけた。次に図２（３）に示すように、貫通穴を含め全体に厚さ１２μｍの銅めっきを行い、その後、貫通穴に絶縁性樹脂を充填した。次に図２（４）に示すようにエッチングによって内層回路を形成した配線基板を得た。次に図２（５）および（６）に示すように、実施例１で示したのと同様な方法で多層板用材料を作製した。次に図２（７）に示すように内層回路を形成した基板の表面に多層板用材料を位置合わせして重ね、圧力２．５ＭＰａ、温度１７０℃、６０分間、加圧加熱して多層板を作製した。次に図２（８）に示すようにエッチングによって回路を形成した。更に、図２（５）（６）（７）と同様の工程を経て多層化し、表面の銅箔をエッチングすることにより、図２の（９）に示すような多層配線板を製造した。

【００２０】（実施例３）図３（１）に示すように、厚さ１８μｍ銅箔に、絶縁層としてエポキシ樹脂系接着フィルムＡＳ-６０００（日立化成工業（株）製、商品名）を貼り合わせ硬化させて全体の厚さが０．１ｍｍの片面銅張積層板を準備した。次に図３（２）に示すように、銅箔をエッチングして第２層目の導体パターンを形成した。次に図３（３）に示すように、引き剥がし可能な有機フィルムとして厚さ５０μｍのポリエチレンテレフタレートフィルムに、絶縁性接着剤層となるＡＳ-６０００を塗工して半硬化状態にした厚さ３０μｍの絶縁性接着剤層塗布フィルムの絶縁性接着剤層の面が片面銅張積層板の絶縁層の面と接するように貼り合わせた。次に図３（４）に示すように、層間の接続を行なう場所に炭酸ガスレーザを照射して銅箔に到達する直径０．１５ｍｍの非貫通穴をあけた。次に図３（５）に示すように、銅ペーストＮＦ-２０００（タツタ電線（株）製、商品名）をポリエチレンテレフタレートフイルム面に印刷して非貫通穴に銅ペーストを充填し、１５０℃で１０分間乾燥した。次に図３（６）に示すようにポリエチレンテレフタレートフィルムを引き剥がした。次に図３（７）に示すように、銅箔の厚さが１８μｍで全体の厚さが０．２ｍｍのガラスエポキシ片面銅張積層板をエッチング法で配線パターンを形成して内層板を作製しその内層回路を形成した配線基板表面に銅ペーストを充填した片面配線形成基板を位置合わせして、圧力２．５ＭＰａ、温度１７０℃、６０分間、加圧加熱して第２層目導体層を作製した。次に図３（８）（９）（１０）に示すように、（１）から（６）と同様の工程によって、第３層目、第４層目、第５層目の銅ペースト充填片面配線形成基板を作製し、（７）の工程と同様にして多層配線板を製造した。

【００２１】（実施例４）図４（１）に示すように、厚さが０．１ｍｍのガラスエポキシ両面板を用意した。次に図４（２）に示すように０．２ｍｍの貫通穴をあけた。次に図４（３）に示すように、貫通穴を含め厚さ１２μｍの銅めっきを行い、貫通穴に絶縁樹脂を充填した。次に図４（４）に示すようにエッチングによって内層回路を形成した配線基板を作製した。次に図４（５）および（６）に示すように、実施例３で示したのと同様な方法で銅ペーストを充填した片面導体パターン形成基板を作製した。次に図４（７）に示すように内層回路を形成した配線基板の表面に銅ペーストを充填した片面導体パターン形成基板を位置合わせして重ね、圧力２．５ＭＰａ、温度１７０℃、６０分間、加圧加熱して多層板を作製した。更に図４（８）に示すように、図４（５）（６）（７）と同様の工程を経て多層配線板を製造した。

【００２２】（実施例５）図５（１）に示すように、厚さ１８μｍ銅箔に、絶縁層としてエポキシ樹脂系接着フィルムＡＳ-６０００（日立化成工業（株）製、商品名）を貼り合わせ硬化させて全体の厚さが０．１ｍｍの片面銅張積層板を準備した。次に図５（２）に示すように、銅箔をエッチングして第２層目の導体パターンを形成した。次に図５（３）に示すように引き剥がし可能な有機フィルムとして厚さ５０μｍのポリエチレンテレフタレートフイルムに、絶縁性接着剤層となるＡＳ-６０００を塗工して半硬化状態にした厚さ３０μｍの絶縁性接着剤層塗布フイルムの絶縁性接着剤層の面が片面銅張積層板の絶縁層の面と接するように貼り合わせた。　次に図５（４）に示すように、層間の電気的接続を行なう場所に炭酸ガスレーザを照射して銅箔に到達する直径０．１５ｍｍの非貫通穴をあけた。次に図５（５）に示すように、銅ペーストＮＦ-２０００（タツタ電線（株）製、商品名）をポリエチレンテレフタレートフィルム面に印刷して非貫通穴に銅ペーストを充填し、１５０℃で１０分間乾燥した。次に図５（６）に示すようにポリエチレンテレフタレートフイルムを引き剥がし、銅ペーストを充填した片面導体パターン形成基板を作製した。同様にして図５（９）（８）（７）に示すように第３層目、第４層目、第５層目となる片面導体パターン形成基板を作製した。次に図５（１０）に示すように、、銅箔の厚さが１８μｍで全体の厚さが０．２ｍｍのガラ

スエポキシ片面銅張積層板をエッチング法で配線パターンを形成して内層回路を形成した配線基板を作製した。次に図５（１１）に示すように、内層回路を形成した配線基板表面に第２層目から第５層目の銅ペーストを充填した片面導体パターン形成基板を順番に重ねて位置合わせし、圧力２．５ＭＰａ，温度１７０℃、６０分間、加圧加熱して多層配線板を製造した。

【００２３】（実施例６）図６（１）に示すように、厚さ１８μｍ銅箔に、絶縁層としてエポキシ樹脂系接着フィルムＡＳ-６０００（日立化成工業（株）製、商品名）を貼り合わせ硬化させて全体の厚さが０．１ｍｍの片面銅張積層板を準備した。次に図６（２）に示すように、銅箔をエッチングして第２層目の導体パターンを形成した。次に図６（３）に示すように引き剥がし可能な有機フィルムとして厚さ５０μｍのポリエチレンテレフタレートフイルムに、絶縁性接着剤層としてＡＳ-６０００を塗工して半硬化状態にした厚さ３０μｍの絶縁性接着剤層塗布フイルムの絶縁性接着剤層の面が片面銅張積層板の絶縁層の面と接するように貼り合わせた。　次に図６（４）に示すように、層間の電気的接続を行なう場所に炭酸ガスレーザを照射して銅箔に到達する直径０．１５ｍｍの非貫通穴をあけた。次に図６（５）に示すように、銅ペーストＮＦ-２０００（タツタ電線（株）製、商品名）をポリエチレンテレフタレートフイルム面に印刷して非貫通穴に銅ペーストを充填し、１５０℃で１０分間乾燥した。次に図６（６）に示すようにポリエチレンテレフタレートフイルムを引き剥がし、第２層目の銅ペーストを充填した片面導体パターン形成基板を作製した。同様にして、図６（８）に示すように、第３層目の銅ペーストを充填した片面導体パターン形成基板を作製した。図６（７）に示すように、実施例１の図１（１）から（５）と同様の工程によって、第４層目の銅ペーストを充填した多層板用材料を作製した。次に図６（９）に示すように厚さ１８μｍ銅箔を準備し、図６（１０）に示すように、第１層目の銅箔と第２層目、第３層目の銅ペーストを充填した片面導体パターン形成基板と第４層目の銅ペーストを充填した多層板用材料を順番に重ねて位置合わせし、圧力２．５ＭＰａ、温度１７０℃、６０分間、加圧加熱して一体化した多層板を作製した。次に図６（１１）に示すように、エッチング法によって最外層の配線を形成して多層配線板を製造した。

【００２４】

【発明の効果】以上に説明したように、本発明により、簡略な工程で配線の高密度化が可能な多層配線板の製造が可能になる。

【図面の簡単な説明】

【図１】（１）～（９）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

【図２】（１）～（９）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

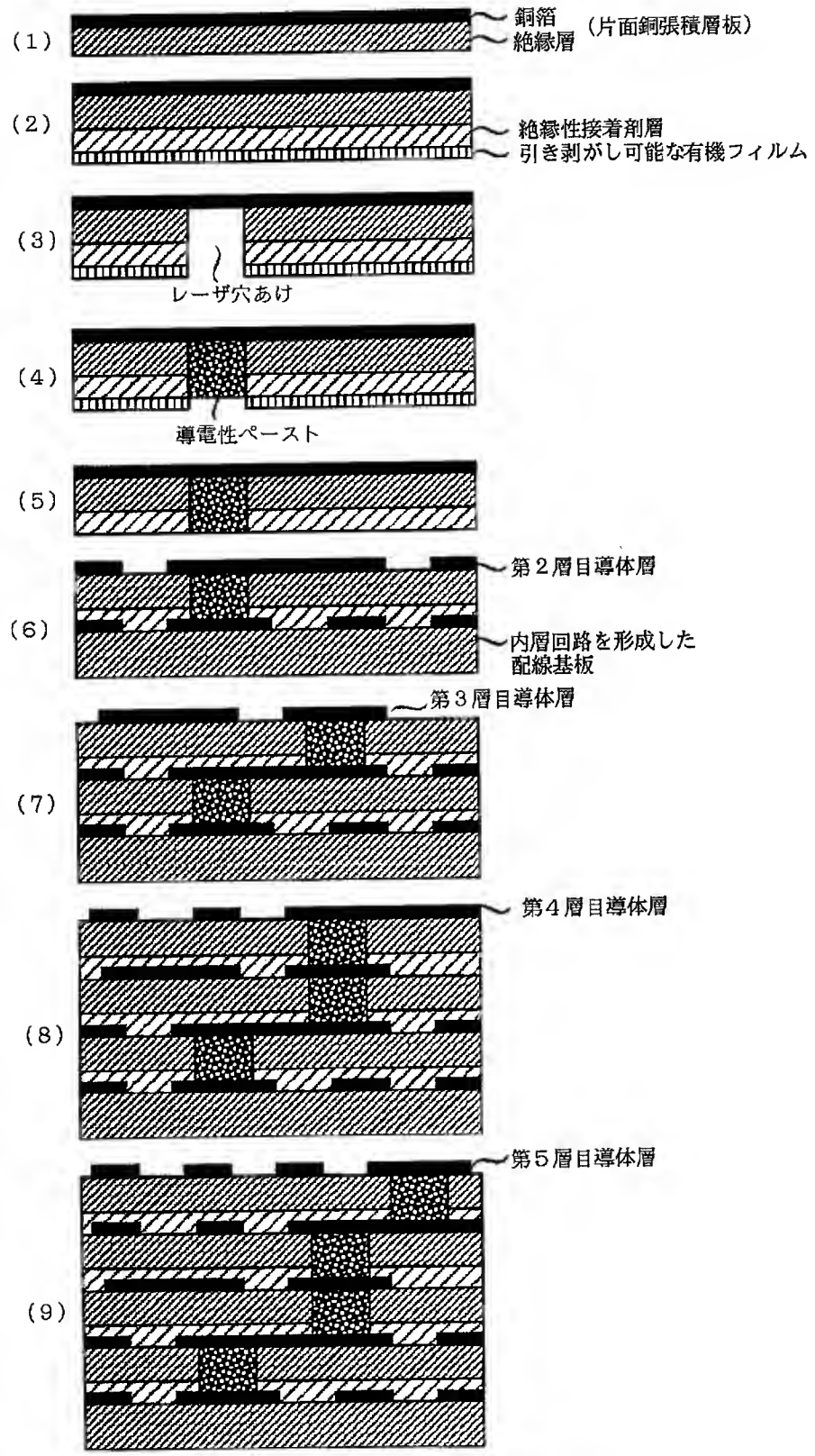
【図３】（１）～（１０）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

【図４】（１）～（８）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

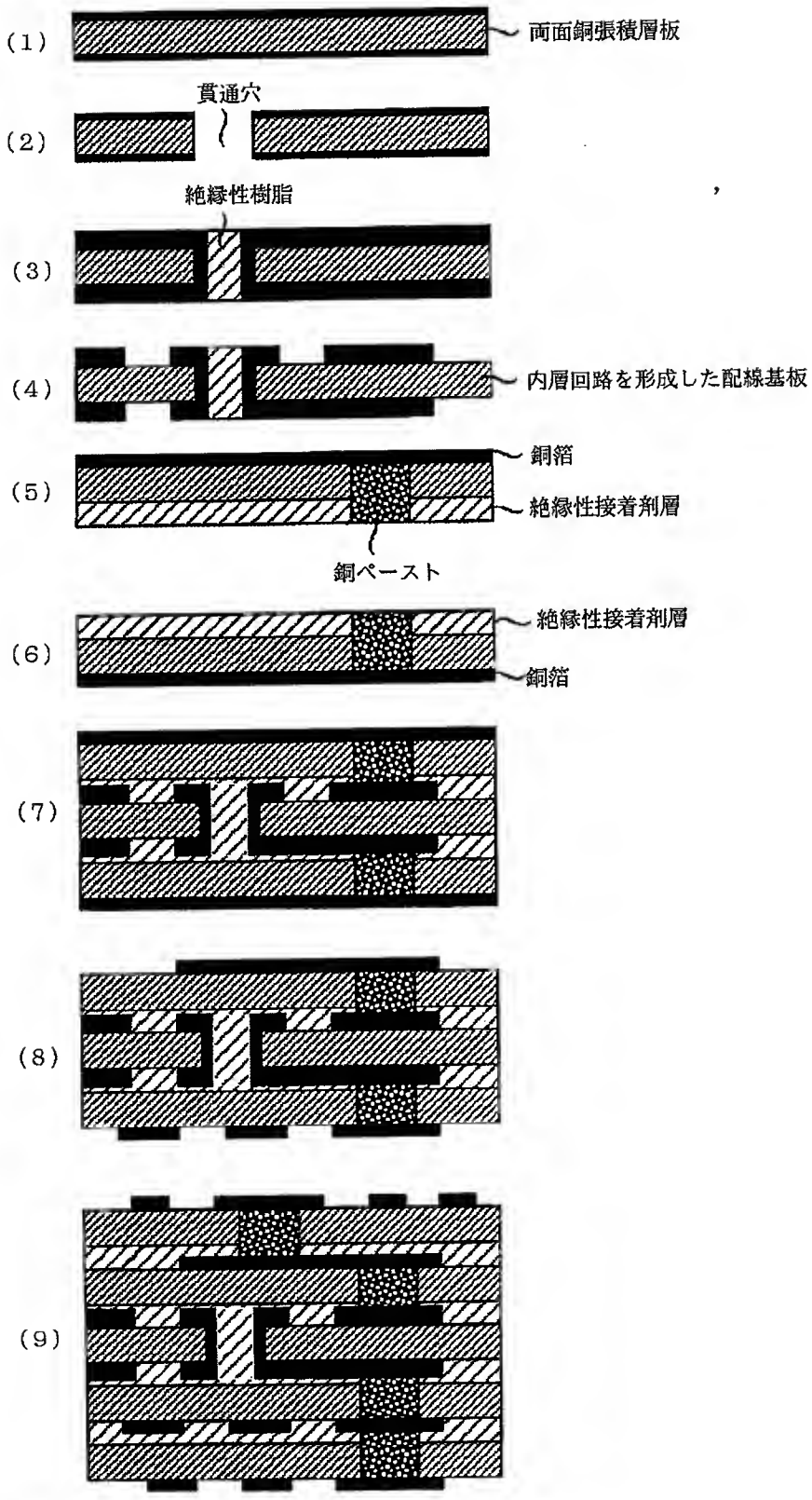
【図５】（１）～（１１）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

【図６】（１）～（１１）は、本発明の多層配線板の製造方法の一実施例を示す基板の断面図である。

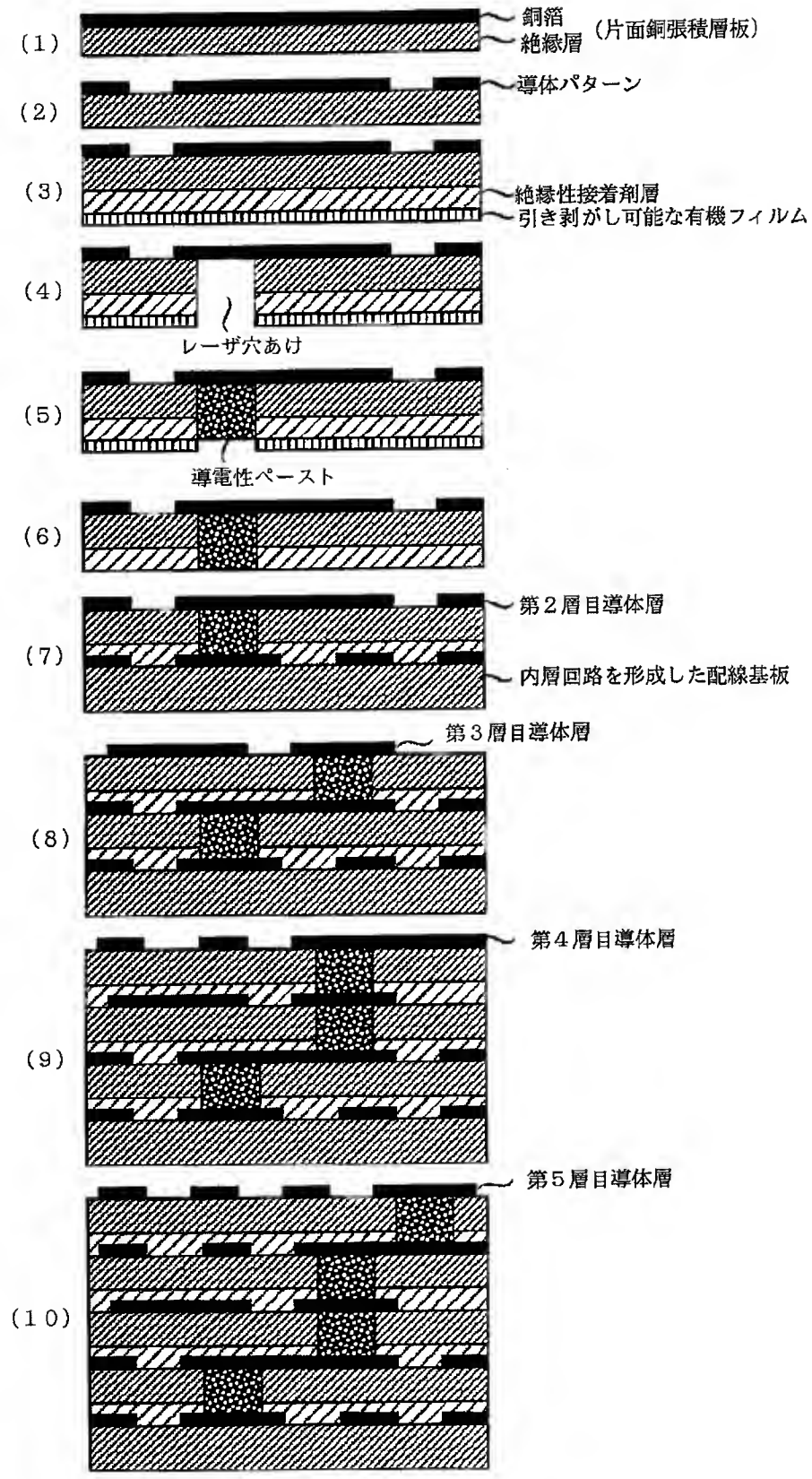
【図1】


(1)
銅箔
絶縁層
（片面銅張積層板）
(2)
絶縁性接着剤層
引き剥がし可能な有機フィルム
(3)
レーザ穴あけ
(4)
導電性ペースト
(5)
(6)
第２層目導体層
内層回路を形成した
配線基板
(7)
第３層目導体層
(8)
第４層目導体層
(9)
第５層目導体層

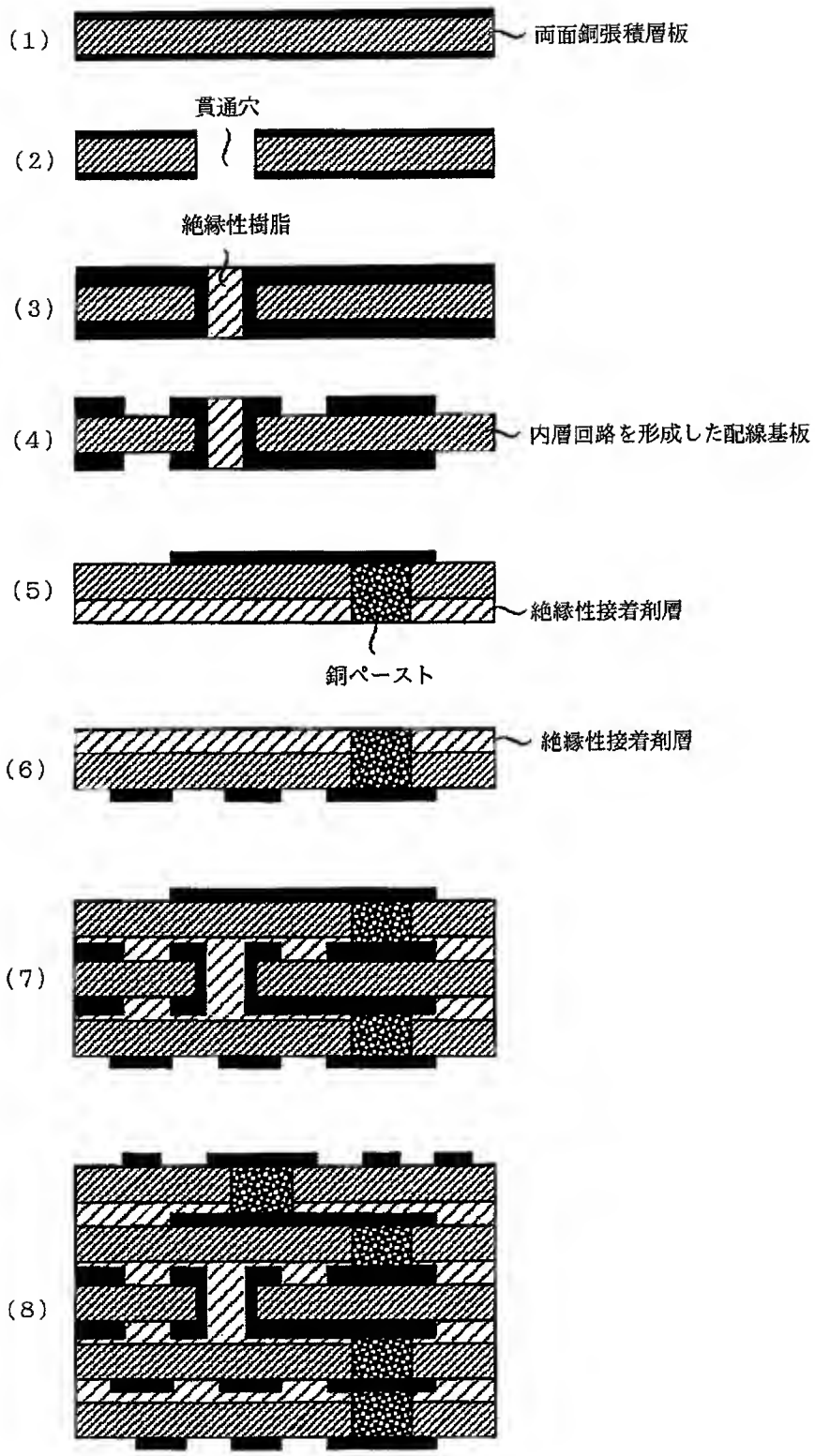
【図2】


(1)
両面銅張積層板
貫通穴
(2)
絶縁性樹脂
(3)
(4)
内層回路を形成した配線基板
銅箔
(5)
絶縁性接着剤層
銅ペースト
絶縁性接着剤層
(6)
銅箔
(7)
(8)
(9)

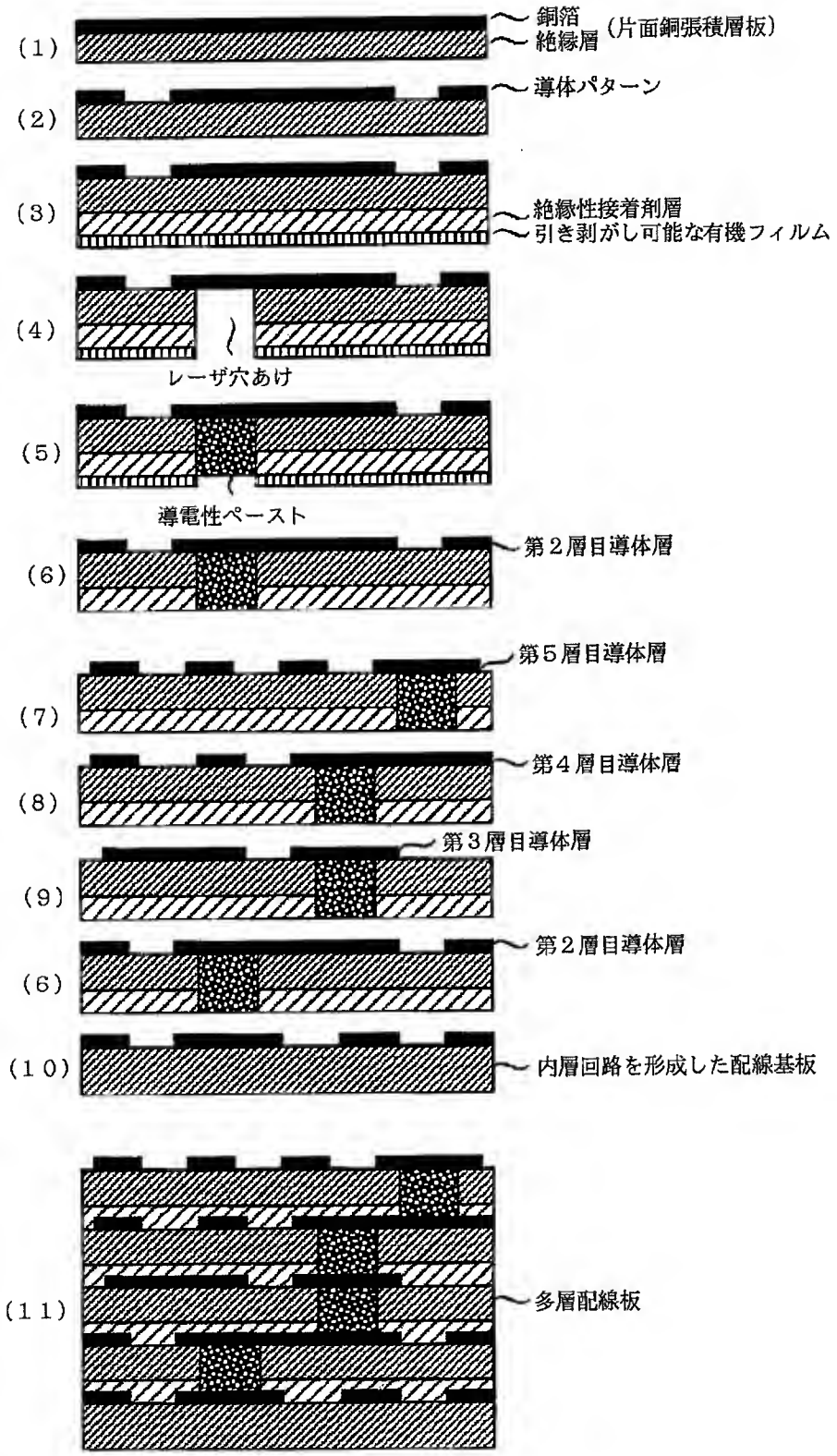
【図３】


(1)
銅箔
絶縁層
（片面銅張積層板）
(2)
導体パターン
(3)
絶縁性接着剤層
引き剥がし可能な有機フィルム
(4)
レーザ穴あけ
(5)
導電性ペースト
(6)
(7)
第２層目導体層
内層回路を形成した配線基板
(8)
第３層目導体層
(9)
第４層目導体層
(10)
第５層目導体層

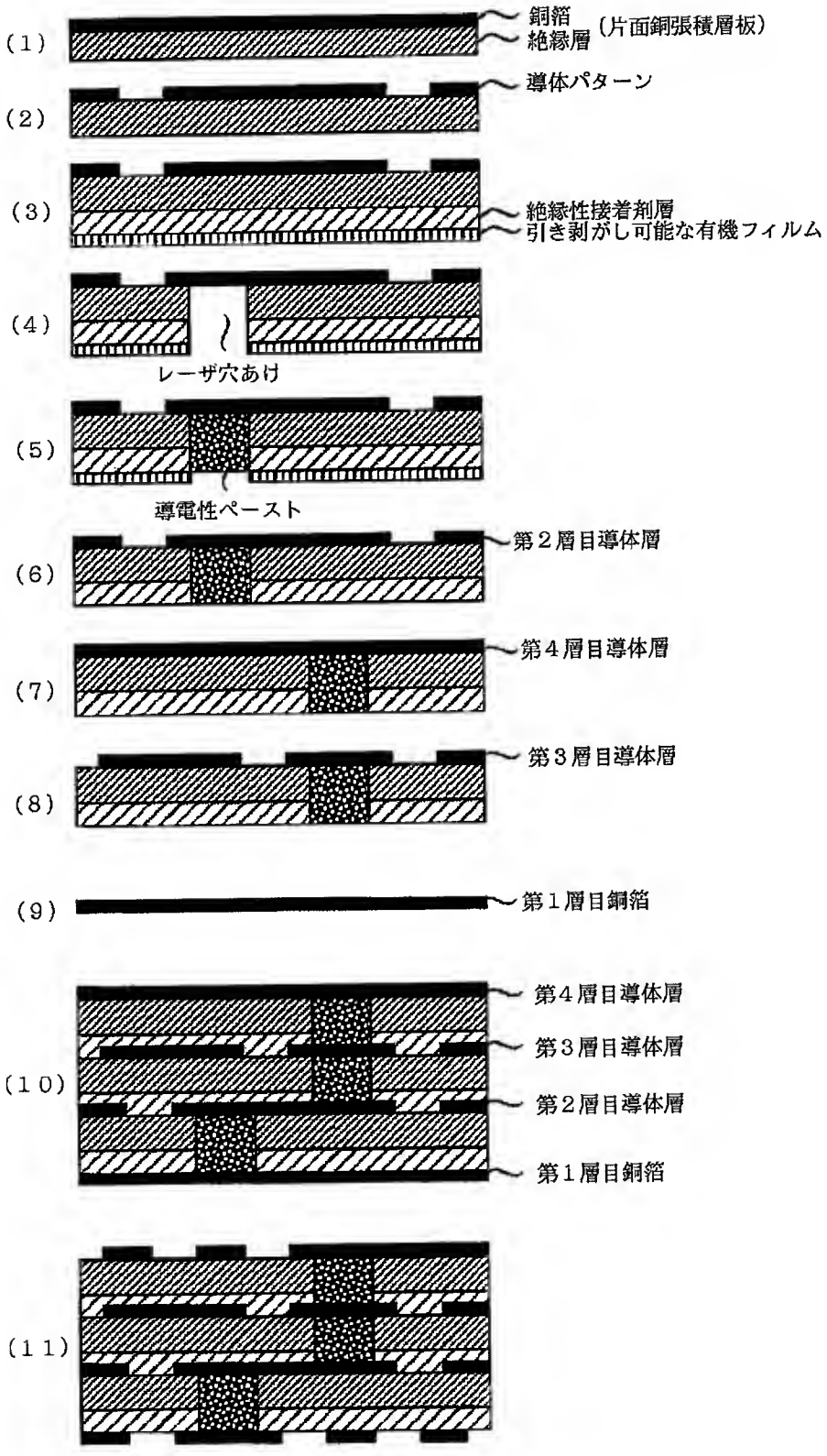
【図４】


（１）
両面銅張積層板
貫通穴
（２）
絶縁性樹脂
（３）
（４）
内層回路を形成した配線基板
（５）
絶縁性接着剤層
銅ペースト
（６）
絶縁性接着剤層
（７）
（８）

【図５】


(1)
銅箔
絶縁層
(片面銅張積層板)
(2)
導体パターン
(3)
絶縁性接着剤層
引き剥がし可能な有機フィルム
(4)
レーザ穴あけ
(5)
導電性ペースト
(6)
第２層目導体層
(7)
第５層目導体層
(8)
第４層目導体層
(9)
第３層目導体層
(6)
第２層目導体層
(10)
内層回路を形成した配線基板
(11)
多層配線板

【図6】


(1)
銅箔
絶縁層
(片面銅張積層板)
(2)
導体パターン
(3)
絶縁性接着剤層
引き剥がし可能な有機フィルム
(4)
レーザ穴あけ
(5)
導電性ペースト
(6)
第２層目導体層
(7)
第４層目導体層
(8)
第３層目導体層
(9)
第１層目銅箔
(10)
第４層目導体層
第３層目導体層
第２層目導体層
第１層目銅箔
(11)

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